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April 15, 1997

To: U.S. Patent & Trademark Office -

ATT: Examiner Kevin Lee - Group 3407

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Fax No: 703-308-7765

From: Robert V. Sloan

Re: Appl. 08/186,469

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Examiner Lee:

In response to our phone conversation, I am faxing herewith a copy of the proposed claim, the cover sheet of International Application WO96/07813 and page 1 of the claims therein.

Very truly yours,



Robert V. Sloan
Reg. No. 22,775

RVS:jlq

Enclosure: via facsimile transmission

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PR P SED CLAIM

A gas flow control device connected to a tubing for use in oil-wells producing by continuous gas-lift, consisting of a housing and a nozzle mounted in said housing, said nozzle having a continuously open passage through which gas is allowed to flow, wherein said passage consists of a curved inlet portion through which gas flow is speeded up, a smooth straight intermediate portion providing a main restriction to gas flow and a smooth, outwardly tapered conical shaped outlet portion through which said gas flow is gradually slowed down, reducing the gas pressure loss throughout the valve ^{vague & indefinite} approaching the ideal sentropic flow.

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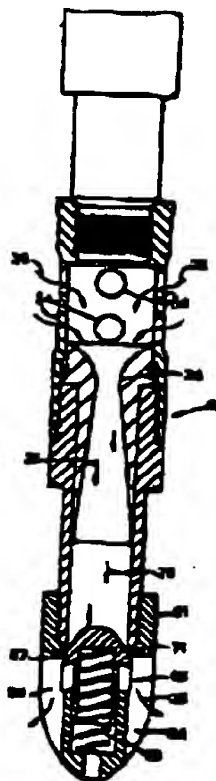
With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: GAS LIFT FLOW CONTROL DEVICE

(57) Abstract

A gas flow control device (60) for injecting gas into a downhole production string for recovering pressure and reducing frictional losses, so that critical flow can be reached at lower pressure drops and higher production pressure, includes a housing, inlet ports (54), a nose end (61) with check valve (65), and outlet ports (64), and a nozzle (34) having first and second ends, and a flow path therebetween, and a Venturi having first and second ends, and a flow path therebetween. The first end of the Venturi portion is disposed adjacent to the second end of the nozzle. The Venturi flow path is coaxially aligned with the nozzle flow path to provide a continuous flow path therethrough. Such a flow control device that has a gas flow rate performance that is independent of the tubing pressure, even when the tubing pressure is as high as 80 % to 93 % of the casing pressure, can be used to increase the production rate, improve the lift efficiency, and eliminate or suppress instability in continuous-flow gas lift wells.



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CLAIMS:

1. A gas flow control device for injecting pressurized gas into a production tubing string, which device comprises a housing including at least one inlet port and at least one outlet port; and an orifice comprising a nozzle portion and a Venturi portion; said nozzle portion including a nozzle first end, a nozzle second end, and a nozzle flow path between said nozzle first end and said nozzle second end, said nozzle flow path converging from said first nozzle end to said second nozzle end; and said Venturi portion including a first end and a second end, and a Venturi flow path therebetween, said Venturi flow path diverging from said Venturi first end to said Venturi second end, said Venturi first end being disposed adjacent said nozzle second end, said Venturi flow path being aligned with said nozzle flow path to provide a continuous flow path; whereby in use pressurized gas flows into said at least one inlet port of said gas flow control device, through said continuous flow path, and out through said at least one outlet port into said production tubing string.
2. A device according to claim 1, wherein said nozzle portion includes curvilinear sidewalls extending from said nozzle first end to said nozzle second end.
3. A device according to claim 1 or 2, wherein the diameter of the nozzle first end is greater than the diameter of the nozzle second end; and the diameter of said Venturi first end is equal to the diameter of the nozzle second end, the diameter of the Venturi second end being greater than the diameter of the Venturi first end.
4. A device according to claim 1, 2 or 3, wherein the cross-sectional area of the nozzle first end is greater than the cross-sectional area of the nozzle second end; and the

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